DOCUMENT RESUME

ED 256 371 IR 051 113

AUTHOR Peters, Paul Evan, Ed.
TITLE Command Language and Screen Displays for Public Online Systems. Report of a Meeting Sponsored by the Council on Library Resources (Dublin, Onio, March 29-30, 1984).
SPONS AGENCY Council on Library Resources, Inc., Washington, D.C.
PUB DATE Mar 85
NOTE 91p.
PUB TYPE Collected Works - Conference Proceedings (021) -- Viewpoints (120) -- Reports - Descriptive (141)

EDRS PRICE MF01/PC04 Plus Postage.
DESCRIPTORS *Information Retrieval; Information Storage; *Information Systems; Libraries; *Library Catalogs; Library Cooperation; *Library Technical Processes; Online Searching; Online Systems; Position Papers; *Programing Languages; *Standards
IDENTIFIERS *Online Catalogs

ABSTRACT

The Bibliographic Service Development Program of the Council on Library Resources convened a meeting of experts in March 1984 to consider the advisability of applying standards in the development and operation of online public access catalog systems in libraries. Following presentations from three invited participants, working groups were formed to discuss and formulate positions regarding issues selected from a list compiled as a result of a 1983 meeting of system designers. Following a summary and preface the document comprises seven sections: (1) Introduction and Background; (2) Synopsis of the Meeting (includes a summary of a presentation by Charles Hildreth); (3) "Command Languages and Codes" (Michael Monahan); (4) "Screen Displays for Public Online Systems" (Joseph R. Matthews); (5) Summary of Working Group Observations and Recommendations; (6) Summary of Meeting Observations and Recommendations; and (7) Concluding Remarks. Each of the four working groups discussed issues related to command languages and codes and to displays and messages, and reported their observations and recommendations. A meeting agenda, a list of participants, and discussion topics of the working groups are appended. (THC)

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COMMAND LANGUAGE AND SCREEN DISPLAYS FOR PUBLIC ONLINE SYSTEMS

Report of a meeting sponsored by the

Council on Library Resources

March 29-30, 1984
Dublin, Ohio

Compiled and Edited by

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Bibliographic Service Development Program

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March 1985

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ACKNOWLEDGMENTS

The Council's Bibliographic Service Development Program has received support from the National Endowment for the Humanities and from the following foundations: the Carnegie Corporation of New York, the Commonwealth Fund, the Ford Foundation, the William and Flora Hewlett Foundation, the Lilly Endowment, the Andrew W. Mellon Foundation, and the Alfred P. Sloan Foundation.

Library of Congress Cataloging in Publication Data
Main entry under title:

Command language and screen displays for public online systems.

1. Catalogs, On-line--Standards--Congresses. 2. Information storage and retrieval systems--Standards--Congresses. 3. Programming languages (Electronic computers)--Standards--Congresses. 4. Information display systems--Library applications--Standards--Congresses. 5. On-line bibliographic searching--Congresses. 6. Library catalogs and readers--Congresses. I. Peters, Paul Evan, 1947- . II. Council on Library Resources.
Z699.A1C56 1985 025.3'028'54 85-4106

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SUMMARY

The Bibliographic Service Development Program of the Council on Library Resources convened a meeting of experts on March 29 and 30, 1984, in Dublin, Ohio, to consider the advisability of standards in the development and operation of online public access catalog systems in libraries. After invited presentations by three of the participants, working groups were formed to discuss and formulate positions regarding issues selected from a list that had been compiled as part of a meeting of system designers held in Baltimore, Maryland, in September 1983. The participants were reconvened to hear reports from each working group and to seek overall consensus. The sense of the group at the close of the meeting was that standards pertaining to command languages are both practical and desirable, whereas those pertaining to displays are premature.

PREFACE

The series of CLR-sponsored meetings held in recent years to consider questions and issues raised by the computerization of bibliographic systems and services reflect a maturing of the library profession. Rather than relying too heavily on "rugged individualism," there is now an honest effort to share experience, to work cooperatively to find appropriate solutions to technical problems, and, perhaps most important, to consider the points of view of all who are involved--system designers, library administrators, and users. In a sense, the idea of "the nation's library" is taking shape because libraries no longer see themselves in isolation.

Reports of these meetings are made available in some detail because the thirty or so individuals who have taken part in each are surrogates for a much larger group. All who are interested have a right to know what was said and, in many cases, share an obligation to help make progress in accomplishing the recommendations.

CLR has no specific objectives of its own concerning the details of this complex subject of bibliographic control. Rather, we try to encourage discussion and appropriate action. As usual, we are grateful to those who took part in the meeting and shared their views and skills.

Warren J. Haas

I. INTRODUCTION AND BACKGROUND

The Bibliographic Service Development Program (BSDP) of the Council on Library Resources began actual work in 1979 with funding from seven private foundations and the National Endowment for the Humanities. Initial estimates were that BSDP's objectives would be met within five years and at an expenditure of $6.2 million. The complexity of the work to be done, a shortage of skilled individuals available in key institutions, and a gradually expanding agenda have combined to extend the time frame by about two years, but the cost projection has proven to be sound.

The environment into which the BSDP was born included three domestic organizations competing for the shared cataloging business of the nation's libraries: the Online Computer Library Center (OCLC), the Research Libraries Group (RLG), and the Washington Library Network (WLN). Some analysts thought that one and only one of these organizations would prevail, but the Network Development Office of the Library of Congress (LC) and many others foresaw the development of a true national network of libraries as an alternative scenario. The BSDP was founded to promote exactly such an eventuality.

The nature of BSDP program interests has changed over time. While the fundamental concern of the BSDP has always been the needs of library users, the first projects focused on systems and linkages between them. As progress became apparent in these areas, the funding emphasis shifted to services provided to library users. This shift can most easily be detected in an examination of program funding as

measured by grants and contracts in each of the five years already completed. This information and a comprehensive BSDP bibliography can be found as an appendix to the report on a meeting sponsored by the BSDP in December 1983.[1]

The BSDP's best-known efforts include strengthening primary databases (such as those containing name authority and serials records); linking LC, the Research Libraries Information Network (RLIN), and WLN for the real-time exchange of name authority data; and evaluating online catalogs and their use. Less well-known is the fact that the BSDP has convened seven carefully targeted meetings involving relatively small numbers of experts. Topics have included linking, authorities, online catalogs, subject access, costs of online catalogs, training users of online catalogs, and online catalog design. This document and the meeting upon which it reports fall within this series.

The topic for this meeting was suggested during a previous meeting attended by system designers and held in Baltimore, Maryland, in September 1983.[2] At that meeting a number of participants expressed surprise at the prominence of the issue of standards in individuals' thinking and the group's discussions. It also became apparent that a number of participants were very receptive to the value and timeliness of standards for online public access systems. This reason and the progress being made by the International Standards Organization Technical Committee 46 toward establishing a standard for command language led to the convening of the Dublin meeting.

References

1. Paul Peterson, comp. and ed. Bibliographic Services and User Needs. Report of a conference sponsored by the Council on Library Resources, Kansas City, Missouri, December 14-16, 1983. Washington, D.C.: Bibliographic Service Development Program, Council on Library Resources, March, 1984.

2. Brian Aveney, comp. and ed. Online Catalog Design Issues: A Series of Discussions. Report of a conference sponsored by the Council on Library Resources, Baltimore, Maryland, September 21-23, 1983. Washington, D.C.: Bibliographic Service Development Program, Council on Library Resources, July, 1984.

II. SYNOPSIS OF THE MEETING

C. Lee Jones called the meeting to order and introduced Rowland Brown, who welcomed everyone to OCLC, expressed a few thoughts about the importance of the meeting and its subject, and wished the participants good fortune. Mr. Jones thanked Mr. Brown for the use of his excellent facilities and warm hospitality and assured him that the participants were prepared for the task ahead of them.

Mr. Jones then briefed the participants on CLR's Bibliographic Service Development Program (BSDP) and the sequence of meetings that established the background for the present one (Chapter I, "Introduction and Background," summarizes these remarks). Mr. Jones then introduced Charles Hildreth.

Mr. Hildreth began the program by outlining the history of National Information Standards Organization (Z39) Subcommittee C (Standard Terms, Abbreviations, and Symbols for Use in Interactive Information Retrieval):

1. The Subcommittee was formed in 1980 with the express purpose of "recommending terms and abbreviations which would be used in inter-active online searching of bibliographic databases in order to reduce the existing diversity in the command languages presently in use."

2. A brief description of the Subcommittee's background, approach, and activities was published with a call for thoughts about six basic questions in the January 1983 issue of the journal Online.[1]

3. The program of work of the Subcommittee was formally suspended in March 1983 so that attention could be focused on the rapidly developing activities of International Standards Organization (ISO) Technical Committee 46 Subcommittee 4 Working Group 5 (Application Level Protocols for Automation in Documentation).

4. Pauline A. Cochrane resigned from the chair of NISO(Z39).G, a position she had held since the Subcommittee's formation in the fall of 1983, in anticipation of an extended trip outside of the United States.

5. Charles Hildreth represented the United States at a London meeting December 12-13, 1983, called by ISO 46/4/5, at which a revision of a working draft of document N44, "Specification for Commands for Interactive Search Systems," was discussed. A decision on this working draft was postponed, pending additional consideration by the U.S. and others.

6. The program of work of the Subcommittee was redefined and reactivated in the spring of 1984 with Charles Hildreth accepting appointment as the chair. A statement describing the Subcommittee's charge as drafting an "American National Standard Command Language for Use in Interactive Information Retrieval" is provided as an appendix to this chapter.

Mr. Hildreth elaborated upon the special challenge presented by the fact that ISO 46/4/5 is at such an advanced stage in drafting an international standard while NISO(Z39).G is at a much more preliminary stage in drafting an American national standard:

1. In many European countries standards promulgated by ISO have the force of law by virtue of either statutory provision or accepted practice; consequently, United States vendors providing systems and services to international markets may find themselves obligated to comply with standards that are at best unknown to them, and at worst troublesome, given established principles of operation.

2. Although there is no such requirement to comply with international standards within the American market, the facts that the American National Standard, once promulgated, will assume a similar role (particularly in procurements for governmental agencies) and that its development will be under the control of the United States should not offer undue comfort. The long-standing and wide-ranging complications created by the United States' use of "English measures" while the rest of the world uses international standard "metric measures" provide a clear object lesson in the undesirability of having the United States go its own way, and in the lack of grounds for the sometimes expressed belief that "sooner or later in technology the world comes around to the United States' way of doing things."

3. The Europeans are for the most part working from a single frame of reference represented by the common command language of the DIANE facility of EURONET. The United States is in an excellent position to enrich the deliberations by virtue of its longer and more varied experience with library and information systems. The Europeans acknowledge that this is the case but point out that the expertise of the United States has not been made available to ISO in a dependable and consistent fashion and that they are prepared to proceed without it because of the urgent need for a standard of any description.

Mr. Hildreth explained that during 1984, NISO(Z39).G will try to represent the interests of the United States in the deliberations of ISO 46/4/5 while preparing and distributing for U.S. reaction a draft American National Standard. He then expressed his view that the goals of a common command language (uniformity, consistency, ease of learning/relearning, ease of use, and more immediate access) should not be allowed to be subject exclusively to the constraints of technology or the fortunes of good will and dumb luck. Rather, it is now apparent that progress toward these goals requires guidelines and standards and the hard work needed to produce them. He commented that this position was not immediately appealing to him and that many people in the rapidly growing and changing field of library and information systems are understandably cautious about ideas that could stifle creativity and interfere with competition. Mr. Hildreth suggested that a command language standard does not have to represent or dictate a single point of view, define or constrain system functionality, prescribe a single interface interaction (dialog) mode or level, or close the review and evaluation process. Given this understanding and the dedication to enforce it together with representation and participation in the standards drafting and review process, he declared his

confidence that the goals of a common command language can be approached without undesirable consequences for innovation and competition.

Mr. Hildreth introduced the concept of the user-system interface, originally developed by Thomas P. Moran.[2] This model identifies four levels that characterize all such interfaces:

1. Task -- The user comes to the system with a set of tasks that he wants to accomplish. The purpose of the Task Level is to analyze the user's needs and to structure his task domain in a way that is amenable to an interactive system. The output of this Level is a structure of specific tasks that the user will set for himself with the aid of the system.

2. Semantic -- A system is built around a set of objects and manipulations of those objects. To the system, these are data structures and procedures; to the user they are conceptual entities and conceptual operations on these entities. The Semantic Level lays out these entities and operations. They are intended to be useful for accomplishing the user's tasks, since they represent the system's functional capability. Thus, the Semantic Level also specifies methods for accomplishing the tasks in terms of these conceptual entities and operations.

3. Syntactic -- The conceptual model of the system is embedded in a language structure, the command language, for users to communicate to the system. All command languages are built from a few syntactic elements: commands, arguments, contexts, and state variables. The Syntactic Level lays out these elements. The "meaning" of each command of the system is defined in terms of

operations at the Semantic Level, and the methods at the Semantic Level are recoded in terms of Syntactic Level commands.

4. Interaction -- The dialog conventions for the user-system interaction must ultimately be resolved as a sequence of physical actions -- key presses and other primitive device manipulations by the user, and display actions by the system. The Interaction Level specifies the physical actions associated with each of the Syntactic Level elements as well as the rules governing the dialog.

This model was used to explicate a general structure for all command language grammars. This structure contains three components:

1. Conceptual -- The task and semantic levels, i.e., the needs the user brings to the system, together with the user's understanding of what the system contains and how it can be used.

2. Communication -- The syntactic and interaction levels, i.e., the commands, arguments, contexts, and state variables of the language, together with the physical aspects of presenting commands to and receiving responses from the system.

3. Physical -- More a qualification applied to the other components than a combination of basic user-system interface levels, this component accounts for special adjustments that must be made to provide for the unique operating characteristics of individual devices.

Mr. Hildreth proposed that the concepts of the levels of user-system interfaces and the components of command language grammars be used as a framework for the meeting's discussions and subsequent standards drafting efforts. He expressed his strong personal belief that a standard that addresses one and only one of the aspects of this framework (vocabulary, for instance) will be lessened in scope to such a degree that it will be useless. He emphasized his recommendation that the task at hand be taken to be the development of a common command language standard in all its complexity.

Mr. Hildreth offered the opinion that the differences between direct command, menu-driven, and natural language approaches to managing user-system interfaces are not nearly as important now as they used to seem, and they should not distract or complicate standards drafting efforts. He noted that interfaces of existing systems are clearly evolving toward a mixture of menus and direct commands, with each being used where it is most useful. He recommended that attention focus on devising a common command language as though systems will use it in a direct command interface, with the understanding that menus will be widely used to "set-up" commands prior to their processing by individual systems.

This presentation by Mr. Hildreth stimulated a good deal of discussion and reflection among the participants and established an excellent framework on which the meeting's deliberations were based. Additional perspectives and terms of reference were provided by two papers, which are included as the next two chapters of this report:

1. Michael Monahan's "Command Languages and Codes" and

2. Joseph R. Matthew's "Screen Displays for Public Online Systems."

Both authors explained that their papers were updated versions of those delivered at CLR's October 1983 meeting in Baltimore. The presentation of these two papers brought the morning of the first day to a close.

The afternoon of the first day was devoted entirely to discussions within four separate "working groups," which the organizers had formed and announced as the meeting began. Each working group leader was provided with a list of discussion topics compiled from questions solicited from participants before the 1983 Baltimore meeting. The working groups formulated observations and recommendations that were offered to the whole group during an evening session held immediately after dinner on the first day. The results of the deliberations of the working groups are summarized in Chapter V, "Summary of Working Group Observations and Recommendations."

The morning of the second day was used for whole group discussion and commentary. Upon calling the meeting to order Mr. Jones suggested that it was apparent that more consensus existed about command languages and codes than about screen displays and messages. He invited a concluding discussion of the two main topics and allotted one hour to command languages and codes and two hours to displays and messages. The discussion that ensued is summarized in Chapter VI, "Summary of Meeting Observations and Recommendations."

The morning of the second day and the meeting as a whole closed with an exercise that Mr. Jones noted to be somewhat traditional for CLR meetings. Each participant was asked in turn to express his or her thoughts regarding the meeting and its likely impact and significance. The remarks offered are summarized in Chapter VII, "Concluding Remarks." Before ending the meeting, Mr. Jones thanked the participants for their energetic and thoughtful contributions and wished them safe journeys home.

References

1. Pauline A. Cochrane. Can a Standard for an Online Common Command Language be Developed? Online, January 1983, p. 36-37.

2. Thomas P. Moran. The Command Language Grammar: A Representation for the User Interface of Interactive Computer Systems. International Journal of Man-Machine Studies, 15(1), July 1981, p. 3-50.

Chapter II

APPENDIX

National Information Standards Organization (Z39)

Subcommittee G

Proposed Standard

TITLE: American National Standard Command Language for Use in Interactive Information Retrieval

PURPOSE: The purpose of this proposed standard is to specify the vocabulary, syntax and semantics of a command language for use by people in interaction with information retrieval systems. The command language, in turn, has the purpose of facilitating the use of interactive information retrieval systems by rendering it unnecessary for the user to have to learn or relearn diverse command languages as is now required to achieve similar results on different systems. A command language which is consistent and uniform in respect to vocabulary, syntax and semantics will achieve this aim.

SCOPE: This proposed standard applies to all command-oriented information retrieval systems, irrespective of the nature of the data base or data bases involved (e.g., bibliographic, numeric, chemical, library catalog data bases). This proposed standard does NOT prescribe the command that a particular interactive information retrieval system must implement (thus it does not represent a minimal or basic set of commands). The choice of commands and the number and type of them is left to the individual system designer/implementer. Any command implemented, whether specifically mentioned in this proposed standard or not, must conform to the rules for vocabulary, syntax, and semantics contained herein.

III. COMMAND LANGUAGES AND CODES

Michael Monahan

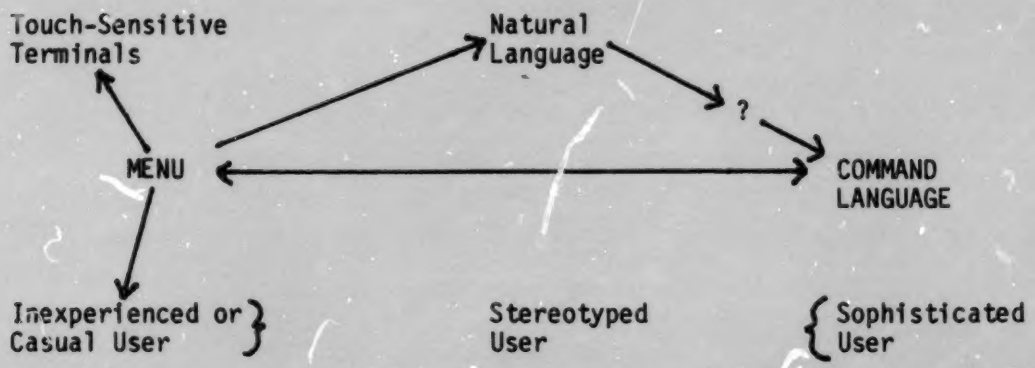
When we think of command languages for an online catalog, we face two conflicting views of its users and their priorities. One view is that users are unfamiliar with the computer catalog and need every encouragement to use it. When I think of this type of user, I tend to think of my grandfather: a nice person, not even remotely mechanically inclined.

The other type of user is sophisticated and eager to make the system jump through hoops as he or she plucks exactly the right record from the complex choices available. Of course, the models for this type of user are us: the system designers.

The obvious problem is that both types of users demand different solutions. Therefore, when we talk about command languages, we work under the stress of these two pressures. Figure 1 shows these tensions.

In this paper, we will explore the relationships presented in this figure and offer some justifications for them.

FIGURE 1: How does the user want to command the online catalog?



Menu-Based Solutions

We start by looking at menu-based command languages. Figure 2 shows the critical elements of a menu command structure. Since the target of a menu is an inexperienced or casual user, it is a truism that the system should be "easy to use." This means that all options must be presented directly to the user. The user commands the system by selecting from the presented choices. These choices lead the user step by step through the system to retrieve available information.

FIGURE 2: Elements of a menu system

--Easy to Use
--All Options Presented on Screen
--Step-By-Step
--Single Digit/Numbered Choices
--Touch-Sensitive Devices
--Natural Languages (?)

In order to make the system attractive, we keep the commands short: typically one character or digit. This means that one or, at most, two keystrokes are needed for each choice. More characters act to defeat the whole purpose of simplicity without offering much in the way of benefit.

In this context, we can consider a touch sensitive terminal or a mouse base terminal, such as LISA, as variations on the menu approach. These devices are simply attempts at better ways to select from the menu. Where the naive user is the prime target, such devices have a major role and new variations will continue to be introduced. Clearly, this is an area of ongoing research.

But to answer the question implied by many system designers, there seems to be little motivation to standardize such menu approaches. If a good menu system is easy to learn, what advantage is there to having one standard? Further, there appears to be little to make standard: no user should remember that choice one is title, or that six inches from the middle of the screen is author. So let us continue to experiment with menu systems and only worry about standards here as a last resort.

Natural Languages

An interesting alternative to the menu for the naive user is "natural language." This approach lets the naive user formulate a question, of whatever complexity, in his or her own words. The computer determines the intended meaning and does the necessary work. If the user has an ambiguous request, the computer detects this and prompts the user to clarify the question. The computer can also respond to requests for help or detect when alternate choices should be listed.

Clearly, this is heaven for the user and system designers will be out of jobs. But examine this sentence:

The firemen met with city council to discuss their salaries.

Clear and understandable? Not unless you know the relationship between the firemen and city council. One can invert "the firemen" and "city council" and still understand the sentence. But this puts a strain on the computer, which must understand the real world in order to correctly determine the meaning of the sentence.

So while great strides are being made in natural languages, and a significant research project in this area would be well in order, we should not expect natural language query systems for our online catalogs to be ready tomorrow.

Command Languages

This leads us to look at command languages. The first issue is: are they necessary? Consider the user approaching the catalog with this question:

> Do you have a French film on computers,
> done since 1979, available immediately in this location?

Clearly, this is not an unreasonable request, and in a large research library it is not hard to imagine queries of this complexity being brought to the system frequently. In fact, as online catalogs become union catalogs of multiple

locations, media, and collections, the need to be this specific in order to limit results to manageable answers will grow.

It would also seem clear that a menu approach would be tedious and confusing for such a query. Figure 3 shows seven steps to get access to this information, the last five of which most systems would assume or not ask.

FIGURE 3: A menu sequence for a sophisticated query

Do you have a French film, on computers, done since 1979, available immediately, in this location?

(1)	Type of Search:	Subject
(2)	Subject of Search:	Computers
(3)	Media (if any):	Film
(4)	Language (if any):	French
(5)	Date Since (if any):	1979
(6)	Location:	Here
(7)	Availability:	Immediate

I think this example points out why we want command languages. It also shows why they will not quickly replace menu systems for the naive user.

If we accept the need to have both a menu and a command language, then what should be the relationship between the two? In many cases, the command language is independent from the menu. They are two different worlds. This would be fine if our two models of users were also independent. However, life is not so simple: the user wanting the aforementioned French film is quite likely to be our naive user. Maybe he wants the film to learn the command language!

If we keep the command language and menu separate, any user wanting to go from one to the other must make a quantum leap. It would seem better to have the menu lead into the commands and, perhaps, teach the user the concepts embodied in the command language. If this can be done, the user learns, or the computer adapts to, the complexity of the system or user needs.

How to do this is left as an exercise. At this point, we can only make the suggestions and begin to experiment with solutions.

Standards

This leaves us with the issue of standards. At the Wye conference (December 1982) 15 months ago, I felt that it was too early to expect standards. Coming to the session in September (the Baltimore meeting on online catalog issues), I was impressed that almost 50 percent of us raised the question of standards for online catalogs. Maybe the time to start is now.

The biggest (non-political) problem is that systems may not be conceptually compatible. Even MARC-based systems may have radically different meanings for an author search. Are series included? Are search techniques keyword, left-to-right truncation, or some algorithm? Which stop words are used?

This incompatibility we cannot change, so let us accept it. Assume that there will exist local features, and that not all systems will support all functions. We can still define a reasonable "low, but not lowest, common denominator." A system could meet the standard, but would be free to extend it. While it is true that this might appear to restrict experimentation, this is a risk I

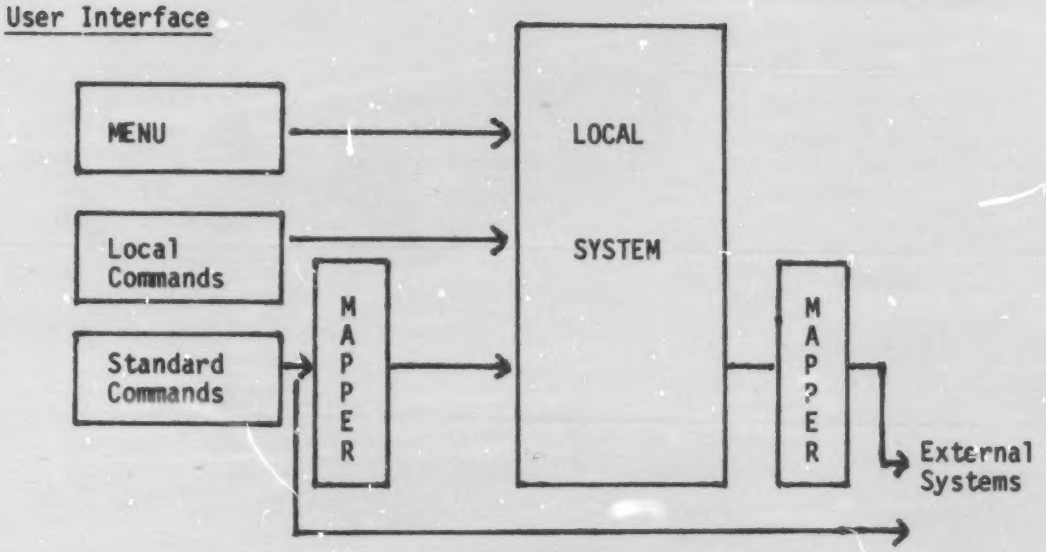
suggest we take. Further, we can assume that some systems will implement the standard as a "side" module, independent from the rest of the host system. This at least offers the naive user from an external site a way to use the system.

It might also be best to accept an imprecise standard, such as: "This is the way to do an author search, but what an author search means will differ from location to location." An imprecise standard would permit us to both agree on something with some dispatch and offer a good chance that systems will quickly meet it.

Merely because a standard is imprecise does not prevent it from being useful. Whether the car in front of us flashes red or orange, square or rectangular, single or double, or a series of lights, we still know it is about to turn.

Figure 4 gives an outline of a system with such an online catalog. It implies that there may be up to three patron interfaces: menu, local command, and standard command. Two of these, menu and local command, go directly to the local system, while the standard command interface must be mapped into the local functionality. On the other hand, the standard command language needs no mapping to the external world.

FIGURE 4: Online Catalog to support standards



A major point is that Figure 4 is the most complex view possible. A system developer need only implement the standard command language to both have an online catalog and talk to the outside world. Local menus and command extensions become options.

I accept that there is a conflict between calling for a menu to command growth path, no menu standard, and a standard command language. But the fact is that we need to address what are different user audiences. And I suspect that the library world will quickly see the benefits as users react with genuine pleasure to being able to transfer their skills from one system to another.

Turnkey library vendors do not get purely pleasant social letters from their clients as often as they would like. Therefore it is worth mentioning a case several years ago when a customer forwarded a compliment received from a user. The

user had just returned from a university in the United Kingdom where he had been very pleasantly surprised to discover that they used exactly the same version of Geac's online catalog. He wrote to express his pleasure and implied that this similarity saved him time in using the system. When a library permits a scholar to preserve skills while pursuing research across multiple libraries, then it is doing its job.

I would contrast this with the situation with another familiar tool. As I travel, even among Geac offices, I am frustrated at the different variations that we seem to have found in the telephone. It's not enough that they ring, chirp, and warble, but one needs an instruction book to use them.

The library world can avoid this frustration if we have a core standard. We must accept local initiatives in delivery devices, menus, and advanced features, but we can provide a common core that will work in all locations. This, I think, is what our users will most demand from us in the next five or ten years.

So much for the technical issues; what about the politics? If even half of the systems represented here adopted a common format for common features, we would have our standard. If we simply acted to define (1) how we now do "common" searches and (2) how we would propose that they or variations could be made into a standard, then we might have it.

The biggest legitimate objection is that we do not know enough to cast things in stone. Certainly, I would react negatively to a standard that limited my ability to experiment. This is why a partial or imprecise standard is needed. This will not eliminate local change or features: if it turns out to be clumsy it

can be ignored. Under this guise it is not a threat to any commercial vendor's competitive instincts. I think that there is enough to compete with that this can be ignored.

So let's do it!

IV. SCREEN DISPLAYS FOR PUBLIC ONLINE SYSTEMS

Joseph R. Matthews

The display of bibliographic information on a CRT screen raises two basic issues: first, the format and arrangement of specific data elements on the screen, and second, the amount of information that is to be displayed for a particular user. The screen layout or display of information on a CRT screen constitutes the most important ingredient of a "user-friendly" interface, yet this is perhaps the most frequently overlooked element of system design.

There are a few guides for screen layouts and displays that provide suggestions to designers of online systems (Siegal and Fischl, 1971; Martin, 1973; Engel and Granda, 1975; Gaines and Facey, 1975; Stewart, 1976; Sutherland, 1980; Shneiderman, 1980; Galitz, 1981; Card et al., 1982). Little of this advice is based on systematic, controlled research. Often designers of online catalogs assume that the arrangement of information on the screen is a relatively straightforward task; thus decisions in this area are dictated by tradition: i.e., the typical card catalog arrangement is adopted for display of bibliographic information, or the task is left in the hands of a computer programmer.

It is my assertion and belief that, since the user of an automated system spends the majority of time reading information displayed on a CRT screen, careful consideration of options for screen layouts and displays should assume a much more important role in the design of online catalogs (Matthews, 1982). The fact that

users of online catalogs too often confront sequences of cluttered screens reflects the lack of attention to this design issue.

The traditional, standardized 3x5 card found in most library card catalogs has been with libraries for so long that knowledge of the evolution of that particular medium has left the consciousness of the profession. It is also assumed by librarians that the display of bibliographic information is understood and appreciated by the user of the card catalog. The layout, punctuation, arrangement of data elements, and spacing of data elements on catalog cards, while broadly uniform from catalog to catalog, is nevertheless more a mystery to the average user than the profession would care to admit.[1]

Alternatives to the card catalog, i.e., the book catalog, the COM catalog, and most recently the online catalog, offer the opportunity for librarians and designers of online catalogs to develop systems that display bibliographic information according to the needs of users rather than the assumptions and traditions of the library profession.

[1]Only 59% of library users in all types of libraries use the card catalog. Known and unknown item searches occur about equally, and subject searching occurs more frequently in public libraries than in academic libraries (Lancaster, 1977; Hafter, 1979; Markey, 1980).

FIGURE 1: Typical card catalog format

HQ
766
.P6368

Pohlman, Edward, 1933-
Incentives and compensations in birth planning. [Chapel Hill] Carolina Population Center, 1971.
vii, 140 p. 23 cm. (Carolina Population Center. Monograph 11)
Bibliography: p. 127-137.

1. Birth control. I. Title. II. Series.

HQ766.P6368 362.8/2
75-635590

EMKTG B/NA A B2-256104 SAMP0039 08/17/83

FIGURE 2: Mankato State

Screen 001 of 001 Record 0002 of 0002 MSU
LOCTN: ERC F229 .C6x
TITLE: Cooking in colonial days: a Williamsberg Kitchen (Filmstrip)
PUBLR: Colonial Williamsburg, 1956.
DESCR: 49 fr., color. 35 mm.
NOTES: Describes the physical location and arrangement of the kitchen and gardens of a typical upper-class home in colonial Virginia. Follows the servants' preparation of breakfast and dinner, showing various types of foodstuffs, cooking utensils, gadgets, and kitchen equipment. Captioned photographs.
SUBJT: Kitchen utensils.
SUBJT: Cookery--History.
SUBJT: Cookery, American--Virginia.
SUBJT: United States--History--Colonial period, ca. 1600-1775.

>

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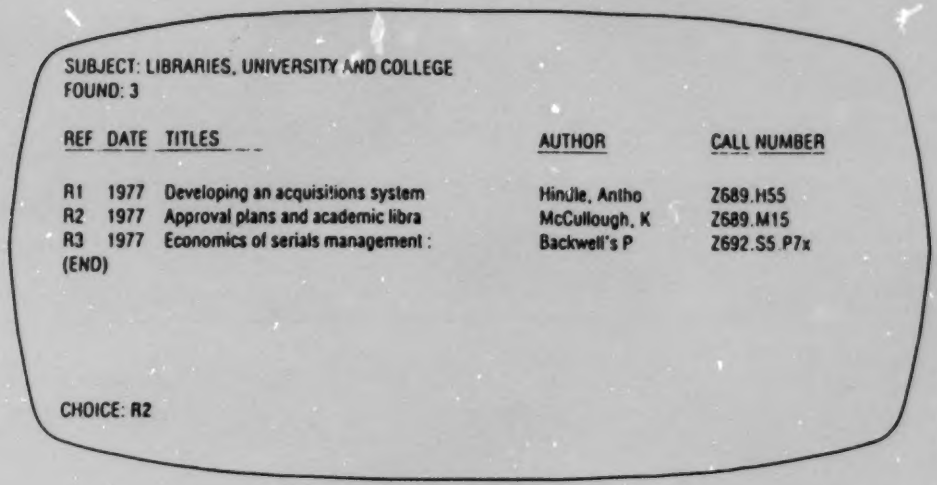
FIGURE 3: NLM Integrated Library System

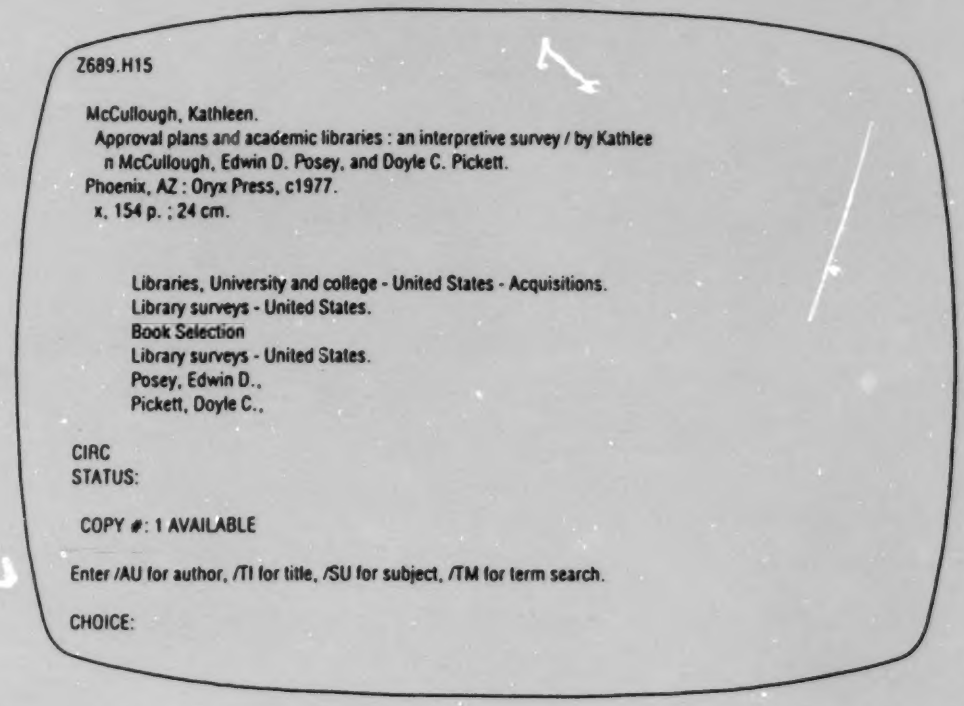


SUBJECT: LIBRARIES, UNIVERSITY AND COLLEGE
FOUND: 3

REF	DATE	TITLES	AUTHOR	CALL NUMBER
R1	1977	Developing an acquisitions system	Hindle, Antho	Z689.H55
R2	1977	Approval plans and academic libra	McCullough, K	Z689.M15
R3	1977	Economics of serials management :	Backwell's P	Z692.S5 P7x

(END)

CHOICE: R2



Z689.H15

McCullough, Kathleen.
Approval plans and academic libraries : an interpretive survey / by Kathlee
n McCullough, Edwin D. Posey, and Doyle C. Pickett.
Phoenix, AZ : Oryx Press, c1977.
x, 154 p. ; 24 cm.

Libraries, University and college - United States - Acquisitions.
Library surveys - United States.
Book Selection
Library surveys - United States.
Posey, Edwin D.,
Pickett, Doyle C.,

CIRC
STATUS:

COPY #: 1 AVAILABLE

Enter /AU for author, /TI for title, /SU for subject, /TM for term search.

CHOICE:

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FIGURE 4: Ohio State LCS

> FBL/1
HF5736K87
KUTTNER, MONROE S , 1929
MANAGING THE PAPERWORK PIPELINE : ACHIEVING COST-EFFECTIVE PAPERWORK AND INFORMATION PROCESSING / MONROE S. KUTTNER. NEW YORK : WILEY, C1978.
XVI,
244 p. ; 24 CM.
INCLUDES INDEX. "A RONALD PRESS PUBLICATION." BIBIOGRAPHY: P. 237-240.
SUB: 1. BUSINESS RECORDS 2. OFFICE MANAGEMENT 3. COMMUNICATION IN MANAGEMENT
LC CARD :77-15041 TITLE :2222111 OCLC :3327400 &9Q780620
PAGE 1 END

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FIGURE 5: University of California MELVYL

Type the number you want below or type HELP, then press RETURN.

1. See a LONG display of this record.
2. Begin new author/title search.
3. Begin new subject search.
4. End the session.

>1

Your search for: subject words ENERGY CONSERVATION HOUSES
retrieved: 1 book from UC libraries.

1.

Author: Benson, Verel W.

Title: A guide to energy savings for the poultry producer / (prepared by Verel W. Benson). (Washington) : U.S. Dept. of Agriculture, (1977)
ii, 46, (1) p. ; 26 cm.

Notes: Cover title.
Bibliography: p. 45-(47)

Subjects: Poultry houses and equipment -- Energy conservation
Energy conservation -- United States.

(Record 1 continues on the next screen.)

Your search for: subject words ENERGY CONSERVATION HOUSES
retrieved: 1 book from UC libraries.

1. (continued)

Other entries: United States. Dept. of Agriculture.

Call numbers: UCB Agricul SF486.B4 (CU-AGRI)

Type the number you want below or type HELP, then press RETURN.

1. See previous screen of this display.
2. Begin new author/title search.
3. Begin new subject search.
4. End the session.

>4

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FIGURE 6: Claremont Colleges TLS

WW
HYMAN BLUMBERG SYMPOSIUM ON RESEARCH IN EARLY CHILDHOOD EDUCATION/WOMEN AND THE MATHEMATICAL MYSTIQUE : PROCEEDINGS OF THE EIGHTH ANNUAL HYMAN BLUMBERG SYMPOSIUM ON RESEARCH IN EARLY CHILDHOOD EDUCATION / EDITED BY LYNN H. FOX, LINDA BRODY, AND DIANNE TOBIN. /BALTIMORE : JOHNS HOPKINS UNIVERSITY PRESS, C1980. /VIII, 211 p. : ILL. ; 24 CM. / (STUDIES OF INTELLECTUAL PRECOCITY ; 8)/# WOMEN IN MATHEMATICS - CONGRESSES. /# WOMEN MATHEMATICIANS - CONGRESSES. /# SEX DIFFERENCES IN EDUCATION - CONGRESSES. /# MATHEMATICS - STUDY AND TEACHING - CONGRESSES. /& FOX, LYNN H., 1944 - CN /& BRODY, LINDA. CN /& TOBIN, DIANNE. CN /& AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. CN /(111)/MAN BLUMBERG SYMPOSIUM ON RESEARCH IN EARLY CHILDHOOD EDUCATION, 8 TH, JOHNS HOPKINS UNIVERSITY, 1976.

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FIGURE 7: Data Research Associates

```
Public Access Catalog          Full MARC Display          Mon 07/19/1982

AAA-0337 Entered: 06/22/1982 Last Modified: 06/22/1982

Type: a Bibl: m Gvt:    Lang: eng Src:    Ill:    Rep:    Enc: 8 Cnf: 0 Ctry:
 ToD: s MED:    Ind: 1 Mod:    Fst: 0 Cont: b    Int 1:    Fic: 0 Bio:
 Dates: 1976

010;   ;  a     76005123 $ o 02867880 $
040;   ;  a DLC $ c DLC $ d VHB $
020;   ;  a 0060115017 : $ c $10.95 $
050; 0 ;  a HQ772 $ b .G38 1977 $
082;   ;  a 155.4 $
049;   ;  a RJB#VXB9,VBB),UJB*,RABA,0QB9,VXBS,VXB=,VXB1,VBBW,VB8%,UJBJ,UJB7,
UJB+UKBU,UKB3,UKB(,RKBY,RJBU,RABQ,RAB*,PJBE,OOBY $
100; 10;  a Gesell, Arnold Lucius, $ d 1880-196l. $
245; 14;  a The child from five to ten / $ c by Arnold Gesell, Louise Bates
Ames, and Frances L. lis, in collaboration with Glenna E. Bullis,$
250;   ;  a Rev. ed. $

Press orange M for more Marc display, yellow Z for title list
```

```
Public Access Catalog          Full MARC Display          Mon 07/19/1982

AAA-0337   Entered: 06/22/1982 Last Modified: 06/22/1982

Type:    a Bibl: m Gvt:   Lang: eng Src:   Ill:    Rep:   Enc: 8 Cnf: 0 Ctry:
ToD:     s MED:    Ind: 1 Mod:   Fst: 0 Cont: b   Int 1:   Fic: 0 Bio:
          Dates: 1976

         010;   ;  a     76005123   $ o 02867880 $
         040;   ;  a DLC $ c DLC $ d VHB $
         020;   ;  a 0060115017 : $ c $10.95 $
         050; 0 ;  a HQ772 $ b .G38 1977 $
         082;   ;  a 155.4 $
         049;   ;  a RJB#VXB9,VBB),UJB*,RABA,0QB9,VXBS,VXB=,VXB],VBBW,VB8%,UJBJ,UJB7,
            ;   ; UJB+UKBU,UKB3,UKB(,RKBY,RJBU,RABQ,RAB*,PJBE,OOBY $
         100; 10;  a Gesell, Arnold Lucius, $ d 1880-1961. $
         245; 14;  a The child from five to ten / $ c by Arnold Gesell, Louise Bates
         Ames, and Frances L. lls, in collaboration with Glenna E. Bullis,$
         250;   ;  a Rev. ed. $

         Press orange M for more Marc display, yellow Z for title list
```


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The typical card catalog format, as seen in Figure 1, is most familiar to those of us who have worked with libraries for a period of time. Yet, as seen in Figures 2-7, there are many ways in which bibliographic information has been displayed via online catalogs.

Some posit that the display of bibliographic information on a CRT screen is not yet thoroughly understood and should be given more attention. Jim Dwyer (1979) has suggested that both COM and online catalogs seem to be tied in part to the format and jargon that have worked so poorly in card catalogs. The "standard" library record format, including indentions, bold or capital letters, red subject headings, abbreviations, symbols, and punctuation can suggest to the uninitiated that they are confronting a foreign language -- the professional language of "librarianese." Neville (1981) has characterized this special language as "biblish." It is, for all intents and purposes, unintelligible to the average user. Why then do we persist in using it?

For a public access online catalog to be a tool that truly meets the needs of the public, the needs of the user must dictate the format and amount of information that is displayed (Matthews, 1982). To be truly effective, the visual presentation of bibliographic information should grow out of the logical structure of the data and facilitate its use by patrons (Reynolds, 1979 and 1980) -- in other words, the design of online catalog screen layouts and displays should be user-driven.

Users surveyed in the recent CLR-sponsored Online Catalog Study indicated that the majority of the interface problems they experienced were concentrated in the areas of search formulation and understanding and control of displays (Matthews

et al., 1983). In simple terms, they had trouble making the catalog tell them what they wanted to know. This should tell us something!

One of the reasons users cannot get catalogs to work is that only a portion of the information displayed in each record is relevant to their search requirements. Sometimes the data sought by the user is buried in the middle of a record. Online catalog technology offers many opportunities -- as yet unexploited -- to tailor search results to users' needs.

When designing an online catalog and deciding the amount of information that is to be displayed, it must be remembered that all online catalog users do not bring similar needs to the catalog. Thus, defining a variety of user classifications is both possible and desirable. The most popular approach groups users into three basic categories (Stevens, 1980), for which short, medium, and full MARC bibliographic records (and for the latter, perhaps a display with and without MARC tags and delimiters) are provided.

It should, however, be noted that terminology describing the possible display options varies considerably. For example, Hildreth notes that one group of similar formats has been variously called: "review, multiple, title, index display, and truncated entry." And in another group, the terms include: "long, full, expanded, total, base, and MARC" (Hildreth, 1982). Similarly, once a number of bibliographic records have been retrieved, a user can move "up or down," "back or forward," or view the "previous screen or next screen." Why can't we limit this proliferation of catalog jargon?

Given the lack of communication to date among designers of online catalogs, a standardized terminology with which to describe various features, displays, and capabilities of online catalogs is not likely to be achieved in the near future. Such a guideline seems like such a simple way to make these new tools easier to use and understand. It's about time system designers quit reinventing the wheel and agreed to cooperate, at least at this minimal level. More recent analysis, on an individual library basis, of the Online Catalog Project data gathered in a number of libraries confirmed the results of the aggregate data analysis reported earlier (Lawrence and Matthews, 1984). More important, however, was the discovery that, in addition to a novice and experienced user system interface, a different user-system interface may be needed for subject searching as well as a separate interface for known-item searching.

Improvements can be made in a variety of areas. While the following discussion will focus on bibliographic records, the advice and suggestions are equally applicable for the display of holdings and status information. There are eight aspects pertaining to CRT display and layouts that must be addressed. These include:

- o layout
- o content and sequence
- o vocabulary
- o typography
- o spacing
- o punctuation (Hildreth, 1982)
- o color
- o graphics.

Layout

The layout -- the manner in which information is formatted or located on a CRT screen -- is crucial to the effectiveness of an online catalog. Two recent studies highlight the importance of layout. Both studies examined users' preferences for formats for the display of information. Tullis (1981), in an experiment with four different CRT display formats, measured the speed and accuracy of users' interpretation of the information displayed on the screen. The formats included a narrative form using ordinary English, a structured tabular format, and two that used color graphics to differentiate and highlight the data elements. The format in which the information was presented had a clear effect on both the users' performance and their preference for a particular format. Tullis found that both the structured format and the graphic formats resulted in significantly faster user response times than the narrative format. However, Tullis recommended the structured text format as providing the best combination of human performance benefits and lower cost of implementation. For the design of alphanumeric displays, he recommended that:

- o Key information should be presented in a prominent location;
- o Logically related data should be clearly "chunked" and separated from other categories of data;
- o Information should be presented in a fixed, tabular format such that users will develop special expectancies; and
- o Presentation of information should be concise.

In a more recent study conducted in a library setting, Benjamin Fryser examined patron preference for versions of a single CRT display bibliographic record: 1) the standard Library of Congress format, or 2) either a table of

contents layout or a vertically arranged and underlined field label presentation. These formats were displayed in a random manner to the subject, one of the experimental formats always being paired with the traditional card catalog format. Fryser concluded that for the 347 students studied, both the table of contents and the "labeled, underlined" formats were significantly preferred over the standard Library of Congress card catalog format. Thus it would appear that imposing the traditional card catalog format onto a new technology, i.e., CRT terminal screens, needs to be examined carefully; from the users' perspective it is not the preferred choice.

In the light of such findings, why do we persist in using it? Data should be arranged in logical groups -- either sequentially, functionally, or by importance (Wright, 1977; Brown et al., 1980).

Consistency in screen displays is also helpful since it can reduce user confusion and frustration by allowing skills learned in one situation to be transferred to other situations. In some online catalogs, the screens frequently do not look like one another, usually because the computer handles different searches in different files in different sequences. Results are displayed according to what the computer has found first. This variation in screen displays means that users are forced to figure out the format of each new display before they can interpret the information content of the response. Identical data should be displayed in a consistent, standardized manner, regardless of the data's origin (Engel and Granda, 1975). Consistency is not difficult to achieve. When will we insist that the requirements of users take precedence over machine processing requirements?

Consistency is the foundation of a system that is easy to learn, easy to use, and easy to remember. The consistency of commands, system behavior, and display screens allows the user to form a simple and easy-to-remember conceptual model of the online catalog. When the conceptual model of the system from the user's perspective closely parallels that of the designers of the online catalog, then the system can be called "user-friendly" (Allen, 1982).

Users often want to locate quickly the call number (appropriate librarianese when the majority of libraries had closed stacks) of a particular item in a library collection. The way in which the call number is identified and displayed is critical to the success of a user-cordial online catalog. On the traditional catalog card, the call number is printed in the upper left- hand corner, just as it will appear on the spine of the item, i.e., in multiple lines. This is done to facilitate transcription and recognition by the user. Today, most online catalogs display the call number on one line; often the call number is not identified at all or it is cryptically identified, e.g., "CAL." At least one online catalog, the Minnesota State University System, with its online catalog developed at Mankato State, identifies the call number as a "location number," although it too is displayed on one line. Furthermore, the call number is typically not set off on a screen by special characters or blank space. In this respect, the traditional card format is superior to online catalog displays. Smug system designers should take note and get busy on devising a solution. Perhaps the call number on a CRT screen should be separately located at the lower left- hand or right-hand corner of the screen and displayed in a multi-line format. Placing the call number at the top of

the screen would mean having the patron turn his head and eyes a greater distance, thus causing discomfort and inconvenience.

Screens that provide a display of information in columns or tabular form must provide labels for each information element -- including line numbers. Assumptions must not be made about the user's ability to understand unlabeled information, e.g., postings.

Another problem with most textual displays is that they use text lines of too great a width. Ideally there should be about 50-55 characters per line, assuming a possible 80-character display width capacity (Rehe, 1974; Galitz, 1981). Further, unjustified text lines are just as legible as right margin justified text (Rehe, 1974). Thus lines should be broken at words rather than splitting a word in half.

Videotex, which uses a character generator and RF (radio frequency) communication techniques, can only display a maximum of 40 characters per line. This seriously reduces the amount of information that can be displayed at one time -- a real online catalog design limitation. However, the possibility of utilizing the graphics and color options of Videotex offers exciting possibilities for the widespread dissemination of information contained in a library's catalog (Toombs and Wilson, 1982).

The technology of the CRT terminal itself offers the designer of the online catalog additional opportunities to facilitate the recognition of information by the user. For example, individual characters, as displayed on the terminal itself,

can be made unique and recognizable in a number of different ways. Words or characters can be made bold or can be underlined. Reverse video, bold and reverse video, double width characters, and double height characters may also be employed. For example, the call number (or perhaps the "location number") could be displayed on the screen employing reverse video.

Field labels should be displayed with characters of regular intensity while variable information (bibliographic data, messages, etc.) could be displayed in bold (brighter intensity). Those few system designers working in the "Park Avenue" library environment can even provide for the librarian, not for the user, a color terminal, and display subject headings in red letters!

While in some libraries the public will need access to a few terminals that will display the full ALA character set, the display of non-Romanized characters will require either the use of special customized terminals or the use of bit-mapped displays.

Content and Sequence

The amount of information that should be displayed to a user is a question that has troubled librarians for a considerable period of time. In a card catalog environment, the solution has been to provide all bibliographic information on the main entry card. Yet in a classic study conducted at the University of Michigan, Palmer (1972) explored the potential of computer catalogs and found that a successful search could be accomplished 84% of the time with only author, title, call number (reflecting location), date, publication, and subject heading

information. If contents notes were included, the success rate would increase to more than 90%.

Based on the results of a more recent survey, a display providing the following data elements would satisfy over 97% of reader and staff needs (Seal et al., 1982):

- o Names (personal, corporate, and conference)
- o Title, subtitle
- o Uniform title
- o Subject headings
- o Added entries
- o Volume number, volume title
- o Edition statement
- o Date of publication
- o Edition and history note
- o References
- o ISBN or control number.

In the online environment, data stored for use by library staff does not have to be displayed to users. Various parts can be extracted from a complete master record for public display. Users can even be given the option to select the level of completeness desired. One of the principal strengths of the online catalog from the user's perspective is flexibility in controlling the amount of information that is displayed. Thus, the motto for the online catalog should be the opposite of the current popular saying, "if you've got it (the full MARC record), flaunt it."

The online catalog can also be used to make the display of information more user-cordial. Consider that most online catalogs now display all matching author entries plus the primary "different author" when the author being searched is an

added entry. For example, if I did an author search for "Peters," and Peters appears to be the third or fourth author, in a single line "index display," Peters is typically not displayed.

If catalogs were to list the name being searched in the brief index display formats, even if that name is not the main entry, this would reduce the confusion that the user experiences when search results do not contain the term requested. Users of the online catalog may not know or care about the sequence of authors, especially for the brief record display. The sequence of authors should, however, be preserved for medium length and full record displays, as users will find this especially important for the preparation of bibliographies.

Transaction logs for several online catalogs indicate that a very small proportion of users (about 5%) request a full MARC bibliographic display (Larson, 1983). Thus, designers of online catalogs should plan for relatively brief displays to be shown automatically (as a default) and display more complete information at the user's request.

Given the significant amount of subject searching that is occurring with the majority of online catalogs, all but the briefest (index) displays should include the full title, subject headings, and call number.

The sequence of information on the CRT screen is just as important as the content itself. Typically the sequence includes, from top to bottom, an indication of the user's prior command or action that resulted in the present screen being displayed; the primary information itself -- be it bibliographic information,

messages, explanatory text, etc.; and the prompts or options currently available to the user. Screen separation should be made apparent to the user through the use of lines or some other form of visible demarcation (Engel and Granda, 1975). The physical location of specific data elements on the screen should be consistent and important, or infrequent messages should be placed in the center of the screen. Instructions should stand out, e.g., be preceded by a series of asterisks (Martin, 1973).

Designers of flexible online catalogs have the opportunity to provide users with the information that they require in the precise sequence in which they are most likely to look for it, without regard to the prior practices of 3x5 librarianship. At least one online catalog, the University of California's MELVYL system, allows the user to specify the data elements to be displayed, e.g., subject headings only.

Vocabulary

The issue of the vocabulary that is displayed to the user of the online catalog is of paramount importance. Most online catalogs use labels to help identify the component data elements of the bibliographic record. However, some use two- or three-letter mnemonics or abbreviations to identify bibliographic data elements. Examples of the kind of truncated bibliographic jargon that is incorporated into existing online catalogs include: ME for main entry, CO for collation, IM for imprint, TI for title or title statement, SUB for subject, and CAL for call number. In addition, the same labels or mnemonics found in different online catalogs often imply or have different meanings. In some catalogs, for example, TI or "title" may actually include more than title statements (imprint

and/or collation). "Call number" may include library and location within the library, in addition to the call number itself.

As noted earlier, the Minnesota State University system identifies the call number as a "location number," or LOCTN. From the patron's perspective it would appear, based on experience with this online system, that users understand and prefer the concept of a location number much more readily than a call number. Questions about the location number and its meaning tapered off after its introduction, and are relatively infrequent when compared to prior experiences at the reference desk in answering questions pertaining to call numbers.

What is needed is a project to determine what many users, at various levels of sophistication, call the various data elements.

In addition to the display of bibliographic information, a system interacts with users through prompts, diagnostic messages provided as a result of a user's error, information messages, and status messages. Galitz (1981) has suggested that to minimize ambiguity, a message should:

- Use short, meaningful and common words
- Not use abbreviations
- Not use contractions or short forms
- Use brief, simple sentences
- Use affirmative statements
- Use active voice
- Order words chronologically, e.g., "enter search and press RETURN" rather than "press RETURN after entering search."

Given the development of online catalogs to date, self-explanatory screens are a realistic goal. Almost one-third of the users in the CLR study learned to use

the online catalog by reading the instructions on the screen and another 20% learned to use it "by myself" (Matthews et al., 1983, p. 105).

Explanatory text, instructions, and prompts must be carefully chosen and, preferably, pre-tested. IBM, for its 24-hour automated teller machine, originally asked the user to ENTER dollar amounts for each transaction. After discovering some people searching for a door to "enter" the machine, IBM now asks users to KEY IN information.

Given the range of literacy levels in the general population, individual words must be judiciously chosen to avoid ambiguity and to ensure that the word itself is understood by the vast majority of users.

Typography

Most online catalogs display bibliographic information in a combination of upper- and lowercase letters. However, at least one, the Claremont Colleges' online catalog, displays all information in uppercase only. Research has demonstrated that people read upper- and lowercase information more easily than uppercase print only (Tinker, 1963; Poulton, 1968; Stewart, 1974; Brown et al., 1980; and Galitz, 1980). However, people do read data element labels faster when they are all uppercase. A common failing of many screens is that labels (captions) and data tend to blend into one another. This problem should be easily solved through the use of spacing and uppercase-only labels.

Spacing

In books, blank space costs money; therefore its use is carefully controlled. Blank space is almost "free" when used on computer screens, and therefore can be used more frequently to emphasize and improve the readability of the information being displayed. Blank characters do, however, have to be transmitted but this is not a serious problem given the volume of "real" characters that typically need to be displayed. People have preferences for the amount of information displayed on a screen and these subjective feelings decline if more or less information is presented when compared to the preferred amount (Vitz, 1966). A well-designed page of printed material has a density loading of about 40%. CRT display screens that are subjectively preferred have a density loading of only about 15% to 20% (Damchak, 1976). Thus the spacing of information on a CRT screen -- which typically is 80 characters in width, with between 16 and 20 lines of usable display space -- must be carefully considered. Reynolds (1980) in a study of COM catalogs suggested that the chunking or separation of information through the use of space improved the readability of COM catalogs. This is likely to be true for online catalogs as well.

Punctuation

Most online catalogs do not display bibliographic information in a consistent manner. A number of online catalogs use a slash, hyphen, colon, or comma to separate data elements within the bibliographic record. Since contractions, hyphenations, and abbreviations demand an additional interpretation process, their use should be restricted or eliminated (Engel and Granda, 1975). System designers and librarians must challenge their past assumptions in the system design

process. The challenge is to think about the display of information from the user's point of view.

Why should ISBD punctuation, which was developed for the printed medium, be preserved in the online catalog environment? Barbara Markuson has suggested we are actively creating a bibliographic petit point through the use of dots, slashes, and dash-dash. The continuation of traditional punctuation, codes and abbreviations, indention, etc., would seem to be based on the desire to make librarians comfortable rather than on a desire to meet the needs of the user. This is backward thinking!

Based on the results of available research and the suggestions made by various system designers, the bibliographic record shown in Figure 8 is offered as one possible option for the display of bibliographic information on a CRT screen.

FIGURE 8

AUTHOR: National Research Council, Committee Intercity Highway, Freight Transportation
TITLE: Piggyback; 5 reports
CONTENTS: History and regulation of trailer-on-flatcar movement, by J. Ayre; The public interest and course of action in optimizing rail-highway transportation, by R.S. Reebie; Factors in future developments of rail piggyback, by B.N. Behling; Effect of piggyback operation on volume of highway track traffic, by A.C. Flott; Containerization in transporting agricultural perishables, by J.E. Clayton.

SUBJECT: Truck Trailers, Demountable

PUBLISHER: Washington: Highway Research Board, Division of Engineering, National Research Council

NOTE: Papers sponsored by the Committee on Intercity Highway Freight Transportation and presented at the 45th annual meeting of the Highway Research Board.
YEAR: 1967
Includes bibliographies

CALL NUMBER:
TE7
H5
no. 153

Color

As in the case with the layouts of CRT screens, there is little specific research data about using color in screen design. However, some useful advice may be found in Krebs (1978), Christ (1975), and Robertson (1979). Galitz (1981) also provides a chapter on color in his Handbook of Screen Format Design.

Color can fruitfully be used to link logically related data, differentiate between required and optional data, highlight errors, and separate prompts, instructions, and the data itself (Morland, 1983). However, it should be remembered that about ten percent of the male population (less than one percent for women) have some form of color vision deficiency. When color is used improperly, it can cause a performance degradation. And finally, while the costs for color CRT terminals are falling, they are still a relatively expensive item -- especially for a library considering a large number of online catalog terminals.

Colors of most displays can be grouped into a variation of what is perceived as red, green, blue, and white. The color coding scheme must be relevant and known to the user. Not knowing the color code's meaning will distract the user. And,

most important, color must be used consistently. Color associations already exist in the world at large and must not be ignored: e.g., red means stop or danger.

While the human eye can discriminate no more than eight colors (Krebs, 1978), as colors are added to a screen, confusion and the time needed to differentiate between the added colors will increase. In general, alphanumeric displays should be restricted to no more than four colors; graphic displays may safely use more colors (Galitz, 1981). And the warm colors of red and yellow appear larger than the cooler colors of green and blue (Tedford et al., 1979).

Graphics

Graphics is a technology that is increasingly employed, even for such mature applications as word processing, e.g., Apple's Lisa or Macintosh and Xerox's Star. And while a number of excellent reviews of graphics research have been assembled (Takeuchi and Schmidt, 1980; Meyers, 1981; and Swezey and Davis, 1983), little is known about the potential of graphics in combination with the display of bibliographic information.

Call to Action

Designers of online catalogs have the power to move the current prototype and first-generation online catalogs toward a "user driven," second-generation online catalog.

Short Term Actions

To meet this objective it would seem that several short-term steps should be taken:

1. Designers of online catalogs should stop working in a vacuum. They should meet periodically, e.g., at ALA Conferences and/or ASIS, to discuss issues of mutual interest and share new concepts and techniques.

2. Consideration should be given to the preparation of a report that presents a synthesis of available knowledge and research about the display of bibliographic information.

3. Designers of online catalogs should find out what users need. As noted by Shneiderman (1980), more controlled studies of online catalogs need to be conducted. Obtaining the reactions of users to alternative screen layouts and displays on a systematic basis will do much to turn the seat-of-the-pants "art" of screen displays into a science. Also, the results of these studies, however brief, need to be shared in the literature.

4. Designers of online catalogs should call a stop to the needless proliferation of jargon. The profession needs a standard glossary of online catalog terms, complete with definitions, so that system designers, librarians, and users of online catalogs can begin to use the same terminology when describing or identifying the same concept, screen, etc.

Long Term Actions

1. Designers of online catalogs should try to limit the number of search "surprises." Work should commence to develop a set of consistent, standard screen display formats for use in existing and future online catalogs. Much as the layout and arrangement of data elements are generally uniform from card catalog to card catalog, so should users find online catalogs; they should not be faced with the prospect of learning to decipher a new online catalog display in the search process in each different library.

Through the use of controlled experiments, it should be possible to systematically explore and discover user preferences for:

- o The layout of bibliographic information on a CRT screen.
- o The sequence in which bibliographic information should be presented.
- o The labels for data elements.

Based on these study results, it should be possible to develop guidelines.

2. Designers of online catalogs should not require users to learn more than one new language. Work should commence to develop a standard online catalog command language. Online catalog designers should join librarians in the standards development process. While use of specific online catalog functions or features would be left to the discretion of the system designer, if a particular function was employed, then the specific command associated with that function would be standardized.

3. Designers of online catalogs should be willing to change existing designs, however "elegant" from a programmer's standpoint, to accommodate the needs of library users.

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V. SUMMARY OF WORKING GROUP OBSERVATIONS AND RECOMMENDATIONS

Four working groups were formed by the meeting organizers and were announced when the meeting began. Each working group leader was provided with a list of discussion topics compiled from questions solicited from participants in advance of CLR's September 1983 meeting in Baltimore. The working groups met the entire afternoon of the first day to formulate their observations and recommendations. The results of these deliberations were presented to the whole group at an evening session after dinner on the first day. They are summarized below in the order the presentations were made.

Group 1 -- Command Languages and Codes

1. Impacts on existing systems and services will be significant; standards drafting efforts should be fully aware of economic and political issues and sensitive to cost/benefit concerns.

2. The application context should be clear; the differences between information storage and retrieval, online public access catalogs, and perhaps other systems should be considered.

3. The type of user should be clear; the audience to benefit most from such standards should be identified.

4. The type of database should be clear; the differences between bibliographic, numeric, graphical, and perhaps other data structures should be considered.

5. Standards that address these four concerns should be developed with particular care to be specific and clear about the structure (components, relationships, syntax, etc.) instead of merely the vocabulary of commands associated with precisely defined functions.

6. A meta-language should be developed so that command languages can be characterized and explicated within a common frame of reference.

7. Basic research should be undertaken to identify/discover key performance variables in the use of command languages.

Group 1 -- Displays and Messages

1. A new NISO(Z39) subcommittee should be established to begin work in this area; the time it takes to organize, design and perform a program of work, and process a draft standard requires early action.

2. Comparative investigations analyzing uses of and responses to different types of displays of bibliographic information by different types of users of existing systems should be continued.

3. Error messages are a separate but closely related concern; the messages used by existing systems should be inventoried and consolidated and then subjected

to straightforward "comprehensibility" testing to produce data from which guidelines could be drafted.

4. Basic research (disinterested and with very careful controls) should be undertaken to explore ways to effectively convey information content on cathode ray tubes and other display media.

5. Basic research should be undertaken to identify and characterize common problem situations (no hits, too many hits, unintelligible commands, etc.) so that different systems can be characterized and explicated within a common frame of reference.

6. Attention needs to be given to new user interface technologies such as voice output and expert systems, which promise more cordial and adaptive approaches to displaying and messaging than the technologies used in existing systems.

Group 2 -- Command Languages and Codes

1. A common command designation language is desirable; it should provide consistency as users switch from system to system, thereby strengthening the cornerstone of user-friendliness.

2. Timing for implementation of a common command language will have to be resolved system by system; variant or synonymous forms of command designators can provide convenient bridges between the standard and native usages within a given system, but functional differences indicate that not all designators

can be supported in all systems in this manner and major system modifications eventually will be required.

3. The draft international standard proposed by ISO 46/4/5 (document N44) raises a number of concerns that should be addressed before U.S. support is given. A partial list includes:

   (a) The scope reflects almost exclusively the world of commercial database searching and does not specifically consider the need for and characteristics of integrated library systems (including circulation, acquisitions, and file maintenance functions).

   (b) Some proposed commands conflict with commands in existing systems. For instance, STOP is proposed as a session terminating command whereas in some systems STOP is used to disconnect a terminal from the system; SAVE and DELETE are two other commands for which the functionalities of the proposed standard and that of existing systems are in major conflict.

   (c) All functions covered by the proposed standard are not included in all systems; system providers should be free to decide that a given function will not be supported in his or her system.

4. NISO(Z39).G should include members and reviewers with backgrounds in librariansnip and integrated systems as well as commercial database

searching so that all areas that will be affected by resulting standards will be represented.

5. NISO(Z39), ALA, or some other neutral agency should develop and publish a glossary of terms pertaining to online public access catalog systems with successive editions going progressively further toward the terminological requirements of integrated systems.

6. Standards should be developed for search types and search arguments as well as commands and research, and analysis to this effect should begin as soon as possible.

Group 2 -- Displays and Messages

1. It is not yet time for standards in this area; too many unanswered questions still exist.

2. The following recommendations made by Joseph Matthews in his paper should receive particularly prompt attention:

   (a) System providers should meet frequently to share information and ideas.

   (b) A glossary of terminology pertaining to online public access catalog systems should be prepared.

(c) A synthesis of available information on displays, messages, and help functions should be prepared and the research involved should cover the approaches and findings of the general data processing as well as the library systems community.

(d) The needs of users of online public access catalog systems should be studied much more carefully and comprehensively than has been the case to date.

3. Investigations of user needs should distinguish to every degree possible between what information is presented and how it is presented; the four or five CLR projects currently in process that attempt to make this distinction are extremely important and their methods and findings should be widely reviewed so that improvements can be proposed quickly.

4. The following specific questions should be addressed by any standards drafting efforts in this area:

(a) What levels and types of displays are needed? For instance, do the differences between 300 baud dial-up and 9600 baud direct connections require different standards?

(b) What is the best way to inform a user that his or her search retrieved nothing?

(c) What is the best way to inform a user that his or her search retrieved too much? What is the best way to format short "browse lists" so that users can select from populous retrieval sets or obtain information useful for formulating a new and more precise search request?

(d) What is the best way for different types of displays to be formatted and explained to a user so that he or she can obtain different types of information to aid different types of users and so that he or she will actually use more than one type of display?

(e) What is the best way to sequence the display of items from a retrieval set that contains more than one item? What are the benefits/drawbacks of the common approach of reverse chronological order within subject, and what other approaches would work better in what situations?

(f) To what extent should displays vary as a function of the type of library (academic, public, school, special, etc.) in which a system operates?

Group 3 -- Command Languages and Codes

1. Standards are needed and now is the right time to draft them.

2. A functional taxonomy is needed; existing systems should provide the source material for a comparative research methodology.

3. Agreements as to instrumentation (performance measures, criteria of success/failure, etc.) are also needed.

4. The scope of proposed standards are a critical concern:

   (a) They should be as narrow as possible.

   (b) Distinctions should not be made between information storage/retrieval and online public access catalog systems.

   (c) Search, display, and session control functions should be the first taken up.

   (d) Bibliographic database systems should be the first considered.

5. Existing research provides an excellent starting point; requirements statements and specifications provide useful new information and perspectives.

6. Standards should be statements of consensus regarding the state of the practical art rather than statements of ideal goals.

Group 3 -- Displays and Messages

1. Standards are probably needed, but not immediately, and certainly not before command languages and codes; timing does not appear right even for work to begin.

2. Standards will be derived from investigations of existing systems and available requirements statements and specifications; hardware (physical limitations, technological constraints, etc.) will play a larger role than will be the case for command languages and codes.

3. Agreements as to instrumentation will be easier to reach than will be the case for command languages and codes; definitions of costs and benefits are more concrete.

4. A number of scope considerations will be important:

   (a) Screen design and layout rather than the physical aspects of terminal design should be the concern.

   (b) Screen size should be the major means for classifying standards in this area; "80 character by 24 line" screens should be taken up first.

   (c) Host/terminal communication protocols (block/character mode, synchronous/asynchronous control, etc.) may provide a second necessary means for classifying standards.

Group 4 -- Command Languages and Codes

1. The goal should be to develop standard functional definitions rather than standard command languages. For instance, the meaning of "author search" varies from system to system not only because of the command(s) used but because of the meaning of "author". (Is it last or first name first? Is it authorized

or not authorized? Is truncation implicit or explicit? etc.) The specification and explication of functions is a necessary first step and much more valuable than specification and explication of commands.

2. The type of system at issue should be clearly indicated; most examples discussed during the meeting were drawn from experience with online public access catalog systems, but information storage and retrieval systems are more mature and seem to be the focus of standards drafting efforts currently under way.

3. System users will benefit from standards of this type, but buyers and sellers of systems will too; simplifications in procurement processes will translate into more dependable and less costly installations; and greater commonality among systems will facilitate multi-vendor, inter-system linkages.

Group 4 -- Displays and Messages

1. CLR meetings of this type have been extremely valuable and should continue as a means of updating interested professionals and system providers. Future meetings should include linguists, man-machine communication researchers, and representatives of other disciplines conducting studies and making conclusions of relevance to library systems and procedures.

2. The paper by Joseph Matthews should be widely distributed and discussed; its framework and findings are very useful and they should be criticized and articulated by as many interested parties as possible.

3. Studies of displays should continue at an increasing rate but it is premature to attempt to draft standards in this area until much more is known about alternatives and user reactions to them.

4. Displays should not be considered without considering printed formats as well; they do and will relate to each other and should be designed so that system-to-system consistency isn't obtained by avoidable damage to appropriate display and printed format consistency.

5. Display standards should account for differences among users, data elements provided for material formats (monographs, serials, films, etc.), single/multiple screen displays, and a host of other complicating factors; standards that do not do so could well result in more harm than good.

6. The translation and consolidation of MARC fields/subfields into "chunks" whose definitions and labels users can understand and recall should be a top priority of standards drafting in this area.

VI. SUMMARY OF MEETING OBSERVATIONS AND RECOMMENDATIONS

On the morning of the second day the entire group reconvened to consider the two basic issues of the conference:

1. In which of the two areas are standards desirable and possible and what are the considerations that tip the balance one way or the other?

2. What are the major considerations for defining the range of applicability of the standard(s) and where should efforts start, understanding that it will take some time to cover the entire range?

Mr. Jones expressed his belief that clear signals from the group on these questions would be of tremendous assistance to standards drafting agencies. He established a time budget of one hour to discuss the first and two hours to discuss the second.

The participants had little difficulty offering remarks in response to Mr. Jones' charge; the discussion that ensued was invigorating and remarkably free-flowing, the size of the group notwithstanding. It assumed the form of a brainstorming session at a number of points. At the end of each of the two segments the editor outlined his account of the consensus of the group as he saw it and the participants corrected and elaborated his views. The results of this process of guided but unrestrained discussion, editorial condensation, and participant

verification are summarized in the following. They can be viewed for all practical purposes as a statement of the consensus of the group.

Command Languages and Codes

1. Standards in this area are both possible and desirable; concerned professionals should offer support to and review the products of ANSC NISO(Z39).G and other standards drafting agencies to insure quick and widely representative action.

2. Standards should flow from practice and provide guidance in areas in which commonalities exist and for which convergence is a worthwhile goal. No attempt should be made to limit systems to the provisions of any given standard. Rather, system providers should endeavor to support standards in addition to offering distinctive capabilities and features that express competitive motivations while stimulating imagination and development.

3. Standards in this area should cover functions, nomenclature (names, symbols, and codes), and grammar (rules for linking functions with nomenclature); efforts that attempt less or take up these concerns in some other order will not realize the benefits sought and may be too specific to one or a few existing systems.

4. The focus of efforts in the immediate future should be commands and codes associated with bibliographic/textual data handling systems; this limitation of scope is simply in recognition of available talent and readiness to proceed and should not preclude efforts devoted to numeric, graphic, and other types of data.

5. Search, display, and session control functions should be the second focus of efforts in the immediate future; this limitation of scope is also motivated by current circumstances and should not preclude efforts devoted to functions exercised by operators, administrators, and others who are not end-users.

Displays and Messages

1. Standards in this area are not currently possible and it remains to be seen whether they are even desirable. The major focus in the immediate future should be consistency and flexibility within systems; as these goals are approached, the question of standards across systems can be taken up.

2. However, there is evident willingness and urgent interest to improve displays and messages. This is coupled with an awareness that user-vendor dialog, the MARC format, and reported experiences with general (non-library) systems constitute the primary sources of "research data" currently available. System providers and other interested parties should heed CLR's call for proposals for basic research projects that would provide a comprehensive and stable base of evidence in this area. CLR, moreover, should emphasize this area in future meetings, and in particular, should arrange in the near future a meeting of individuals associated with systems that have undergone changes in displays so that criteria and results can be shared and recorded.

3. Technical considerations are extremely important in this area and different standards will be needed to account for the different technical characteristics of the wide range of communication channels and devices. These technicalities

can be simplified by developing standards in the context of those established by the information processing systems community as represented by standards drafting agencies such as Accredited Standards Committee X3 (Information Processing Systems), among others. Display and message standards will be immediately accessible to a smaller than desirable community because of the necessary linkage to technical matters that are beyond the scope of the average library systems provider and user. Special educational and promotional efforts will be required if and when such standards are promulgated.

4. A second set of considerations, of critical importance but currently underdeveloped, deal with assumptions made by system providers about users and uses and (mis)conceptions held by users about libraries and systems. Standards in this area should not underestimate users' intelligence and adaptability but should account for the major differences among types of users and uses. For instance, displays and messages should vary for novice versus experienced users, internally versus externally motivated users, known-item versus subject retrieval uses, and so forth. Non-users and uses to which systems are not being put present a separate but related set of challenges. Basic research to reveal the knowledge and expectations of users and nonusers, however misinformed or troublesome, should be undertaken as soon as possible. Such research should be predominantly unobtrusive, mindful that at this stage a tremendous amount can be learned by simple observation; it also should emphasize cognitive and performance measures instead of continuing the long-standing emphasis on measures of user acceptance and satisfaction.

5. The two limitations of scope proposed for near-term standards drafting efforts devoted to command languages and codes (e.g., focus on bibliographic/textual rather than other types of data handling systems and on users rather than operators, administrators, and others who are not end-users) should be observed as well in efforts devoted to displays and messages; again, this limitation should be carefully understood to be motivated by a desire to make the best, early use of available talent and experience rather than to preclude attention to other types of data and users.

6. Error messages and the help function in general are promising focuses with which guidelines or standards development in this area could begin in the near future. A taxonomy of common "exceptional conditions" encountered by users of most if not all systems should be developed and used to draft standard ways of alerting users to the occurrence of such conditions together with standard ways for users to request assistance with such conditions. Examples of conditions of this type are "no hits," "too many hits," and unrecognizable or invalid commands.

VII. CONCLUDING REMARKS

The meeting was brought to a close at the end of the morning of the second day with an exercise that C. Lee Jones explained to be somewhat traditional for CLR meetings: each participant was asked in turn to express his or her thoughts regarding the meeting and its likely impact and significance. Even though Mr. Jones asked that participants not feel obligated to express appreciation and thanks to CLR and OCLC, a number of participants were moved to do so and it is fair to say that the participants hold Mr. Jones, CLR, and OCLC in high regard for their respective roles in making the meeting a success. A condensed summary of other individual observations and recommendations follows:

1. A number of participants remarked upon their surprise at how quickly their views on the desirability and possibility of standards in this area had changed from negative or neutral to positive; a few noted that they were leaving the meeting with a position substantively different from that with which they had arrived. It was observed that on the basis of the traditional dedication of librarianship to standards and the specific role played by MARC and general data processing standards, it could have been predicted that library systems professionals would eventually come to this point.

2. It was generally recognized that the consensus of the participants in the meeting should be viewed in light of their collective background. Notice was taken of the relative underrepresentation of types of libraries other than academic and types of librarians other than those concerned with technical

services and systems. At future meetings CLR was encouraged to improve representation of other constituencies and interest groups, even reaching out to other disciplines and industries, and to focus discussion by selecting topics more specific than those selected for this meeting.

3. A frequently expressed vision was that systems will eventually support available standards in addition to supporting one or more other approaches designed by providers or specified by individual user communities. In such a world, system command languages and codes, and screen displays and messages, might well function like vernacular languages and scripts do in many contemporary multi-lingual societies in which there is one language/script for national communication and scores or hundreds of languages/scripts for local communication. Numerous meeting participants remarked that this scenario is much more constructive and much less threatening than one that associates the concepts "uniformity" and "sameness" with the concept "standard."

4. Another expressed view of the future called attention to the difference between "linked systems" and "itinerant users" and noted that the former is a more important planning element than is the latter. Care should be taken to avoid overstating the current difficulties with multiple system use, simplifying the reasons for why the situation exists, and making too much out of the idea that end-users will encounter systems in a manner improved on but essentially similar to the way in which librarians do today. Standards will enable systems to let users pass through "gateways" to other systems while continuing to issue local commands and codes and experiencing the displays and messages with which

they are familiar. These participants urged that more attention be paid to the "linked systems" benefits of the standards drafting efforts at issue.

5. A number of participants reflected upon the necessity and difficulty of involving public service librarians and end-users in the system design process. An appreciation was widely expressed for the pivotal position occupied by these groups and it was generally acknowledged that system providers will not go beyond fraternal arguments about whether features are functional, understandable, learnable, etc., until they improve access to and facilitate co-design with these two groups. Active involvement with end-users and public service librarians was also recommended as a way to come to grips with the highly impressionistic but nonetheless crucial issue of the "feel of the interface."

APPENDICES

APPENDIX A

AGENDA

COMMAND LANGUAGE AND SCREEN DISPLAYS
FOR PUBLIC ONLINE SYSTEMS

Dublin, Ohio, March 29-30, 1984

Thursday, March 29

8:00-8:30 a.m.	Coffee and Danish at OCLC -- Training Room 2
8:30-9:00	Welcome; summary reports on recent, related BSDP meetings -- Lee Jones
9:00-10:00	Report on current developments related to command language standards -- Charles Hildreth
10:00-10:30	Break
10:30-11:15	Command Languages and Codes -- Michael Monahan
11:15-Noon	Screen Layouts and Displays -- Joe Matthews
Noon-1:15	Lunch at OCLC cafeteria
1:15-4:30	Small group discussions
4:30-5:00	Tours of OCLC
6:00-6:30	Cocktails at Stouffer's Dublin Hotel -- Wright Room
6:30-7:30	Dinner
7:30-8:30	Reports from small group discussions

Friday, March 30

8:00-8:30 a.m.	Coffee and Danish at OCLC
8:30-11:45	General discussion, development of recommendations and a research agenda
11:45	Adjournment; lunch available at OCLC for participants not rushing off to the airport

APPENDIX B

LIST OF PARTICIPANTS

COMMAND LANGUAGE AND SCREEN DISPLAYS
FOR PUBLIC ONLINE SYSTEMS

Dublin, Ohio, March 29-30, 1984

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APPENDIX C

WORKING GROUP DISCUSSION TOPICS

Command Languages and Codes

This is an edited compilation of topics suggested for the conference by the participants in CLR's September 1983 meeting in Baltimore. Some questions will be found in both lists since they impact both issues.

1. To what degree should command structures be pedagogic, i.e., direct the user toward comprehension of the structure of the system and/or the information in the area of interest?

2. Are we moving any closer to a standard?

3. Can major libraries realistically expect the establishment of a common command language standard for online catalogs? If so, what would it be modeled on?

4. Does the traditional card image format have a role/value as an online bibliographic display format?

5. Will the evolution to more natural methods of discourse obviate the need for a standard command language?

6. The ultimate unfair question for information retrieval: What kind of language will users want in 5 years? 10 years?

7. In what ways can a command language serve both a novice user who doesn't understand codes and abbreviations and computer types who can't spell past four characters and can only talk in acronyms? Should two different command languages be supplied, or is it possible to construct one that recognizes both types of people?

8. Does anyone see an emerging convention for displays and commands? It seems that commands like FIND AU and DIS 1-2 are becoming common -- MELVYL, RLIN, and WLN do look a little alike.

9. At least two natural language query systems are on the market ("Intellect" and "English"). Do you see this approach, based upon artificial intelligence development, ever being applicable to bibliographic searching?

10. What are the realistic possibilities for standardizing command languages when systems have such a variety of capabilities and database management systems?

11. What are the pros and cons (especially the cons) of command language standardization?

12. When using command languages, what is the user's preference, terseness of codes that may appear cryptic or spelling out the codes more explicitly so that they are less cryptic but require more typing? Also, what is the level of complexity that users are exhibiting? Will they, for example, stack commands into one expression if the system can support such expressions?

13. What does available research say about command languages and codes in terms of ease of understanding by the user? Is there any research about the suitability of chaining of commands using the IBM method, e.g., "/2/1/code/4"?

14. Does it make sense to standardize command languages for online catalogs?

15. What techniques can be used in the design of command languages and codes that facilitate their recall by users?

16. Are voice input, roller balls (as in videogames), mice, touch screens, or other non-keyed command modes applicable to online catalogs? If so, how?

17. Command languages and codes are useful tools for an experienced system user. However, they can confuse the novice, occasional user. Since tomorrow's online catalog must serve the experienced and novice user equally, what design strategies exist to satisfy both types of user? What implementation strategies should be avoided?

18. What can be done to develop a standard command language for online catalogs or, failing that, what can be done to make the existing online catalog command languages more similar to one another than they are now?

19. In trying out various online catalogs, several librarians have remarked that some command languages are much easier to learn and remember than others. Should system designers follow up on these observations and improve their command languages without waiting for standards to be developed?

20. Many commentators argue that the standardization of command languages and codes across systems is an ideal that will not be attained in the near future, particularly where vendor-supplied systems are concerned. As long as the OPAC system and general library automation market is growing, there is a powerful economic incentive to emphasize differences instead of similarities. The history of data processing standards in general also indicates that standards emerge rather later than consumers would prefer. There are commentators, moreover, who hold that standardization at too early a stage runs the serious risk of stifling the sorts of design innovations that clearly separate progressive systems from those which are mundane. What is the wisdom of and prospect for standardization of command languages and codes and what is the best way for system designers to take into account the public's concerns in this regard?

21. As online catalogs proliferate, there arises the very real possibility that there will be many command languages for the user to learn. Should there be a common set of standards to guide the developer in implementing command-driven online catalogs?

22. Assuming that the command language allows for multiple operators in a given expression, i.e., search title=((A and B) or (C and D)), it would easily be possible to overburden the screen. Is there some way to limit this possibility?

23. Do you see a trend toward multi-level command languages to aid both the novice and experienced user? Are multi-level command systems more important with keyword and Boolean search capabilities?

24. The division of incoming data into commands and text generally allows for ambiguity. There are several solutions to this, including using special delimiters for commands or for text or for commands used as text; alternatively, one can attempt error correction. Is error correction worth the effort or is a more restrictive language acceptable?

25. Should systems provide both a command mode and a tutorial or menu-driven mode? If not, which mode is preferred?

26. Studies in the field of cognitive psychology dating back to at least 1943 (Craik,[1] for instance) suggest that people deal with complex mechanisms by forming working hypotheses, or conceptual models about the behavior of the mechanism. As Richard Young[2] points out, the idea of a conceptual model is not well-defined (it also being a model, i.e., of human behavior), but central to it is the assumption that the user will adopt some more or less definite representation or metaphor that guides his actions and helps him interpret the device's behavior. Such a model, when appropriate, can be helpful or perhaps even necessary for dealing with the device but, when inappropriate or inadequate, can lead to misconceptions and errors.

    This suggests that the interactive interface of an automated bibliographic system ought to be designed so that the user can easily construct a concise, accurate conceptual model. This, in turn, requires the designer also to construct a model -- a model of the user -- that describes aspects of the user's purpose, the tasks he or she will use the system to perform, and the abilities and limitations of the user as an information processor.

    In the past, the focus has been upon the development of a static model as the foundation for an "ideal" user interface. More recently, increasing consideration has been given to the dynamic character of the relationship between the user and the system, and to the fact that each user of a system has a unique set of experiences that make his or her conceptual model different from any other user's model. P.R. Innocent[3] has discussed the need for self-adaptive interfaces and for "user re-configurable" (my apologies for an awkward phrase) interfaces, which will provide the flexibility necessary to effective, highly personalized user/system interaction.

    My question is this: What are designers of interactive bibliographic systems doing to provide this kind of flexibility and adaptability? What theoretical goals, on the one hand, should be pursued; and what practical limitations, on the other, must be acknowledged?

Displays and Messages

1. What are the issues/tradeoffs in mixing control information with result information on screens?

2. Is free-face mode clearly better? What about color in displays?

3. Is generalized screen design software sufficiently mature to be widely used in online catalog interface design? What role do you see for touch screen, mouse, or speech input in conjunction with screen design?

4. Can designated areas of screen display be adopted as standard (e.g., a tri-level screen, with areas reserved for search history/system message, search results, and system prompts/instructions)?

5. Where should we be going with the display of index/thesaurus/cross-reference browsing lists?

6. One of the major variables in screen design is the availability of good quality graphics, even if just to design a more attractive display of text. On the other hand, graphics add considerably to cost. Are true graphics worth the price?

7. Must we stick to "Library Standards" when designing screen displays, or are there other options when trying to satisfy the library user? How can the information be displayed so that the user has some idea of what it represents and so he/she can be led to other searches, such as alternative subjects, series (if he knows what a series is), etc.? Also, can a display designed for an 80x24 screen work on an Apple or TRS 80, or worse yet, a hardcopy printer?

8. Does anyone see an emerging convention for displays and commands? It seems to me that commands like FIND AU and DIS 1-2 are becoming common -- MELVYL, RLIN, and WLN do look a little alike.

9. How can the user be allowed privacy while searching the catalog?

10. Can you suggest guidelines for data element positioning, upper/lower-case use, underlining, spacing, use of reverse video, highlighting, and other techniques for ease of identification and scanning?

11. Is there any hard data on the extent of actual patron use of facilities to create one's own display format capabilities? If so, what kinds of options have been provided to the end users to make their own formats, and what have been the user reactions to such an option?

12. What are the important characteristics of good screen layouts and displays?

13. How can we reasonably trade between: good screen format, complete information, and line bandwidth?

14. Is videotex a suitable online catalog medium?

15. What verified design principles exist to guide us in the optimum arrangement of screen displays?

16. What value do color and graphics have in online catalog displays? Will cheap large screen displays be available and used for online catalog displays and, if so, will that affect use of color and graphics?

17. What are the generic characteristics of screen layouts and displays that facilitate effective interaction between the user and the terminal? What techniques are definitely detrimental to this interaction?

18. What overall structure should displays have? We have heard that displays should contain three components, which, from top to bottom, are:

    status - what the computer just searched for the user
    answer - data or an error message
    prompts - suggestions or commands for what the user can do next

    Is this type of screen design the best?

19. What is the best format for bibliographic displays? Should the traditional card catalog paragraph format with numbered tracings be kept or should fields be labeled as to what they are, e.g.:

    AUTHOR:
    TITLE:
    IMPRINT:
    SUBJECTS:
    etc.?

    What data elements should be included in brief bibliographic displays?

20. For journals and large monographic sets, which often have many physical items associated with one bibliographic record, what is the best way to display information about the physical items? By date? By volume number? Should the most recent items be displayed first?

21. The ALA character set presents special problems for all catalog management systems, whether they are designed for public or staff access. Additional character set problems are presented by non-Roman scripts such as Arabic, Hebrew, Cyrillic, Chinese, Korean, Japanese, and many others. Although romanization of cataloging data is an acceptable solution to the keyboarding and searching problems, it can be argued that displays in original script are as necessary in OPACs as they have always been thought to be in card form catalogs. What is the most practical approach to handling these "troublesome" character

sets with special attention to the particular objectives and requirements of OPACs?

22. Displays in OPACs assume two general forms (tagged and formatted), which contain various amounts of bibliographic and holdings detail. Debates about the form usually center around the importance to be attached to similarity to how data has always appeared in the card catalog; outputs produced by commercial search service vendors demonstrate the acceptability of the alternative. Debates about the staging and contents of bibliographic and holdings displays usually invoke reasons based on what users want or need to see when. Is the form issue merely a discussion of two ways to accomplish the same thing, or are important design considerations involved? Furthermore, are designers unduly influenced by how systems retrieve information in their development of bibliographic and holdings displays, or is there solid research information about user wants and needs upon which to draw?

23. Would the use of multicolor display terminals enhance the user's understanding of the catalog, i.e., have instructions in red and data in green?

24. One design goal of an online catalog is to make the system usable by the naive user with minimum intervention by reference librarians. This implies a large number of self-explanatory screens. Are self-explanatory screens a realistic goal?

25. Do systems with complex search capabilities, such as Boolean and keyword, create a greater need to view brief records with an option to proceed to a more complete record? Do users of these system capabilities request full record displays more than users of systems that do not have keyword searching?

26. My users have expressed a need for a conditional paging function -- i.e., don't move a paragraph (group of related elements) to the screen unless there is enough space for it. In practice this takes a fair amount of code and can result in a lot of unused space. Should paragraph breaks always be avoided? If not, what is the best strategy for breaking a paragraph? Which is worse, creating orphans (main body of paragraph on 1st screen) or creating widows (main body of paragraph on 2nd screen)? Once it's determined what will go on a screen, should the waste space be evenly distributed?

27. The University of Chicago technical processing system is currently designed to use SuperBee II terminals, which are ASCII-type devices having scrollable memory. The trend in the library world appears to be in the direction of 3270-type devices (such as the Telex 476L), which have a single-page orientation. As we look to the future, it seems inevitable that we will migrate to a 3270-type environment.

    It strikes me that there are fundamental differences in the approaches one must take to design displays for these two types of devices. In effect, to make the conversion successfully, the programmers in our Systems Group will need to learn to "think 3270." I would find a discussion of the strengths and weaknesses of designs based on both of these types of devices to be very interesting.

A second thought: In our library, there will clearly be a transitional stage where devices of both types may be present side-by-side in a department. Users faced with displays based on two differing approaches to display are likely to suffer. How can this kind of techno-shock be minimized?

28. How important is the display of diacritics and special characters? How can their existence in search terms be circumvented?

29. How many different bibliographic displays does the library patron need? Compare usefulness of a MARC-tagged display, a display with labeled fields, and a display in traditional catalog card format. How complete a display is needed (e.g., notes, tracings)? What is needed that is not found on a catalog card (e.g., language)?

30. Should the online catalog have the same syndetic structure as the card catalog with which the user is presumably familiar?

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